

Data Center Direct-to-Chip Coolants Market by Coolant Type (Water-Glycol Mixture, Dielectric Fluids, Refrigerants), Cooling Technology (Single-phase, Two-phase), Data Center Type (Hyperscale, Colocation, Enterprises), and Region - Global Forecast to 2032

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Abstracts

The data center direct-to-chip coolants market is projected to grow from USD 0.18 billion in 2026 to USD 1.30 billion by 2032, at a CAGR of 38.6% over the forecast period. The growth of the data center direct-to-chip (D2C) coolants market is primarily driven by the rapid advancements in artificial intelligence (AI), machine learning (ML), and high-performance computing (HPC). These technologies have led to an increase in server power densities, resulting in significant heat generation within modern data centers. Traditional air-cooling systems often prove inadequate for managing the thermal loads produced by advanced central processing units (CPUs) and graphics processing units (GPUs). Consequently, many operators are transitioning to liquid cooling solutions, which are more effective in heat dissipation and maintaining stable temperature levels. In the direct-to-chip configuration, cooling systems utilize specialized coolants, such as water-glycol mixtures and dielectric fluids. These systems are capable of cooling high-density racks, which may exceed 60–120 kW, making them essential for the deployment of next-generation AI infrastructure.

“By cooling technology, the single-phase segment is estimated to hold the largest share, in terms of value.”

The single-phase segment is anticipated to lead the data center direct-to-chip (D2C) coolants market by value throughout the forecast period, primarily due to its widespread adoption among hyperscale, enterprise, and colocation data centers. This preference stems from the operational simplicity and cost-effectiveness of single-phase liquid

cooling systems, which align seamlessly with existing infrastructure. In these systems, the coolant remains in liquid form throughout the cooling cycle, allowing for efficient heat transfer while minimizing overall system complexity and maintenance burdens compared to two-phase alternatives. Additionally, demand is strengthened by the ability to integrate these systems into current designs with minor infrastructural changes, supporting the use of commercially available water-glycol blends and engineered fluids that are generally more economical and accessible. The compatibility of single-phase cooling with cold plates, coolant distribution units (CDUs), and facility water loops also facilitates easier deployment and enhances scalability for both retrofit initiatives and new constructions.

“By coolant type, the water-glycol mixture segment is estimated to hold the largest share, in terms of value.”

The water-glycol mixture segment is projected to dominate the data center direct-to-chip coolants market in terms of value throughout the forecast period, primarily due to its widespread use in high-density cooling systems. These formulations exhibit balanced thermal behavior, cost-effectiveness, and operational stability, making them suitable for closed-loop direct-to-chip cooling arrangements. They efficiently transfer heat while providing essential freeze protection, corrosion resistance, and biological stability. As the deployment of artificial intelligence workloads, hyperscale data centers, and high-performance computing (HPC) infrastructure escalates rack power densities, the demand for reliable liquid cooling solutions grows. Water-glycol mixtures are often preferred for their efficient circulation through cold plates and microchannel configurations, effectively preserving system integrity while reducing the risk of corrosion and scaling. Furthermore, their compatibility with mixed-metal constructions, including copper, aluminum, brass, and steel, facilitates broader adoption across modern cooling architectures.

“By data center type, the hyperscale data center segment is estimated to hold the largest share, in terms of value.”

The hyperscale data center segment is projected to maintain the largest share of the direct-to-chip coolants market, driven by the rapid expansion of hyperscale cloud infrastructure that supports artificial intelligence (AI), machine learning, high-performance computing (HPC), and extensive data analytics workloads. The deployment of high-density GPU and accelerator-based server configurations generates significant heat loads, leading to a strong demand for advanced direct-to-chip liquid cooling solutions and specialized coolants that ensure thermal efficiency during

continuous computational operations. Many hyperscale facilities are experiencing rack power densities that exceed the capacity of traditional air-cooling systems, particularly in AI training clusters where densities can surpass 40 to 100 kW. Consequently, direct-to-chip cooling technologies, which circulate coolant through cold plates on CPUs and GPUs, have emerged as the preferred thermal management solution due to their superior heat removal, reduced energy consumption, and enhanced operational stability, prompting operators to invest in advanced coolant options such as water-glycol mixtures, dielectric fluids, and specialized thermal liquids designed for large-scale liquid cooling infrastructures.

Break-up of primary participants for the report:

By Company Type: Tier 1 – 20%, Tier 2 – 40%, and Tier 3 – 40%

By Designation: C-Level Executives– 10%, Directors– 70%, and Others – 20%

By Region: North America – 45%, Asia Pacific – 25%, Europe – 20%, Middle East & Africa – 5%, and South America – 5%

Shell plc (UK), The Chemours Company (US), Castrol Limited (UK), Inventec Performance Chemicals (France), and Valvoline Global Operations (US) are the key players in the data center direct-to-chip coolants market. These players have adopted various strategies, including agreements, product launches, and expansions, to increase their market share and business revenue.

Research Coverage:

The report defines, segments, and projects the size of the data center direct-to-chip coolants market by cooling technology, coolant type, data center type, and region. It strategically profiles the key players and comprehensively analyzes their market share and core competencies. It also tracks and analyzes competitive developments, such as expansions, agreements, and acquisitions undertaken by them in the market.

Reasons to Buy the Report:

The report is expected to help market leaders/new entrants by providing the closest approximations of revenue for the data center direct-to-chip coolants market and its segments. This report is also expected to help stakeholders gain a deeper

understanding of the market's competitive landscape, acquire valuable insights to enhance their business positions, and develop effective go-to-market strategies. It also enables stakeholders to understand the market's pulse and provides information on key market drivers, restraints, challenges, and opportunities.

The report provides insights into the following pointers:

Analysis of drivers (rising adoption of AI and high-performance computing (HPC), increasing rack power density, growing focus on energy efficiency and sustainability), restraints (high initial infrastructure and deployment costs, complexity of retrofitting existing facilities, concerns regarding leakage and system reliability), opportunities (growth of edge computing and 5G infrastructure, emergence of next-generation coolant chemistries, integration with sustainable data center strategies), and challenges (managing extremely high heat fluxes, material compatibility issues, competition from alternative cooling technologies) influencing the growth of the data center direct-to-chip coolants market

Product Development/Innovation: Detailed insights on upcoming technologies, research & development activities in the data center direct-to-chip coolants market

Market Development: Comprehensive information about lucrative markets – the report analyzes the data center direct-to-chip coolants market across varied regions

Market Diversification: Exhaustive information about new products, various types, untapped geographies, recent developments, and investments in the data center direct-to-chip coolants market.

Competitive Assessment: In-depth assessment of market shares, growth strategies, and product offerings of leading players such as Shell plc (UK), The Chemours Company (US), Castrol Limited (UK), Dow Inc. (US), and Valvoline Global Operations (US), and others are the key players in the data center direct-to-chip coolants market.

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